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09/574,955	05/19/2000	Michael J. Renn	881.008US2	9915

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EXAMINER	
SONG, SARAH U	
ART UNIT	**PAPER NUMBER**
2874	

DATE MAILED: 05/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/574,955	RENN ET AL.	
	Examin r	Art Unit	
	Sarah Song	2874	

-- The MAILING DATE of this communication appears on the cover she t with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 June 2002 and 10 June 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *16-19* is/are allowed.

6)☒ Claim(s) *1-15 and 20-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 May 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ :
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

Brian Healy
Primary Examiner

DETAILED ACTION

1. Applicant's communication filed on June 7, 2002 has been carefully considered and placed of record in the file. Claims 13, 26 and 27 have been amended. The abstract, as amended, is approved.

Drawings

2. This application has been filed with twelve (12) sheets of drawings which have been objected to by the Office Draftsperson (see attached form PTO-948) but which are acceptable for examination purposes only. Corrected drawings are required in response to this Office Action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Claim Objections

3. Claims 20, 32 is objected to because of the following informalities: In claim 20, "the through channel" in line 5, and "the optical conductor" in line 6 should be changed to "a through channel" and "an optical conductor", respectively, to correct for the lack of proper antecedent basis for those limitations. In claim 32, Examiner believes that "20" should be –30–, and will be examined accordingly.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. **Claims 1, 2, 4-10, 33, 34, 37 and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Lewandowski et al. (cited by the applicant).** Lewandowski et al. discloses non-atomic (micron sized > 10 nm) particles being guided through a hollow optical fiber by a laser, which confines the particles. A source of the particles is provided before confining the particles inside the beam (inherent). The particles, in air or in aqueous solutions, are guided down the hollow portion of the fiber. Lewandowski et al. disclose 7 μm glass and polystyrene particles. Applications include transfer of a particle (one material) or separation of particles (more than one material), and deposition onto a surface (substrate). It is noted that the laser beam would have inherently imparted a degree of thermal treatment to the particles. It is also noted that hollow optical fibers typically comprise a first opening, upon which an optical beam is incident, and a second opening, through which an optical beam exits, wherein the first and second openings are located at two opposite ends of the optical fiber. Furthermore, since Lewandowski et al. discloses the method of guiding particles through a hollow optical fiber by means of a laser beam, the apparatus inherently includes at least a hollow optical fiber (an optical conductor having a first and second opening, a through channel or a hollow portion), a particle source, and a laser beam since those three elements are necessitated in the method that is disclosed.

6. **Claims 1-3, 5-10, and 30-38 are rejected under 35 U.S.C. 102(b) as being anticipated by Nishimura et al. (U.S. Patent 5,495,105).**

7. Nishimura discloses a method of guiding one or more non-atomic particles. The method comprises confining the particles inside the laser beam and directing the laser beam into a hollow portion of an optical conductor (the beam propagating along the longitudinal axis), wherein the particles confined inside the laser beam are guided by the laser beam propagating inside the hollow portion. See Figure 5, column 1, lines 19-21 and column 5, line 52 through column 6, line 56. Regarding claim 2, the reservoir 41 comprises the source of the particles before confining the particles inside the beam. Regarding claim 3, optical systems 46, 48 and 50 focus the laser beam. Regarding claims 6-8, in column 2, lines 36-38, a liquid dispersion medium, and solid particles made of one material are disclosed. Regarding claim 9, in column 7, lines 42-49, particles made of two or more materials (i.e. differing in refractive index) are disclosed. Regarding claim 10, Nishimura et al. discloses fine particles such as blood cells, viruses, and microorganisms, which have a linear size of larger than 10 nm. For example, red blood cells have a linear size on the order of several micrometers.

8. Regarding claims 30-32, Nishimura et al. also discloses a method of confining a particle inside a hollow portion of an optical conductor, the method comprising, confining the particle inside a laser beam; directing the laser beam with the confined particle into the hollow portion through a first opening of the optical conductor; and transporting the particle inside the hollow portion by causing the laser beam to propagate inside the hollow portion until a velocity (e.g. horizontal velocity) of the particle reduces to about zero. The optical conductor is substantially vertical. The laser beam exits the optical conductor through a second opening. See Figure 5, column 5, line 52 through column 6, line 56.

9. Regarding claims 33-38, Nishimura et al. discloses an apparatus comprising an optical conductor (having axes 43 and 44) having a first opening (defined by the narrowed outlet of reservoir 41); and a laser beam (45) capable of entering the hollow portion (through channel) of the optical conductor through the first opening and propagating inside the hollow portion while guiding one or more particles confined inside the laser beam. Regarding claim 34, the reservoir 41 is the source. Regarding claim 35, note optical system 46. Regarding claim 36, the laser beam exits the optical conductor through a second opening. As noted previously, the hollow portion is filled with a liquid (dispersion medium).

10. **Claims 33-40 and 42 are rejected under 35 U.S.C. 102(e) as being anticipated by Kindler et al. (U.S. Patent 5,993,549).** Kindler et al. discloses an apparatus for guiding one or more particles into a hollow portion of an optical conductor, and more specifically an apparatus for depositing one or more particles onto a substrate. The apparatus comprises an optical conductor (32) having a first opening and a through channel (hollow portion filled with a gaseous medium); a laser beam (28); and a substrate (22) disposed to allow the laser beam exiting the channel through a second opening to contact the substrate. Regarding claim 34, the apparatus further comprises a source (10) for providing one or more particles. Regarding claim 35, the apparatus further comprises an optical system (58) for focusing the laser beam. Regarding claim 26, it is noted that the laser beam exits the optical conductor (32) through a second opening (see column 7, lines 15-19). Regarding claim 40, it is noted that the first and the second openings are located at the two opposite ends of the optical conductor (see Figure 1). Regarding claim 42, the substrate inherently comprises a plurality of locations onto which the particles can be deposited. It has been held that the recitation that an element is "capable of"

performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchison*, 69 USPQ 138.

Claim Rejections - 35 USC § 103

11. Claims 3, 11-26, 35, 36 and 39-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewandowski et al. Lewandowski et al., as discussed above, discloses guiding non-atomic particles (about 7 μm in size, which is larger than a wavelength of conventional laser beams) through a hollow optical fiber by means of a laser beam. Lewandowski et al. discloses particles in aqueous solutions (i.e. comprising a liquid portion and a solid portion). As previously noted, the laser beam would have inherently imparted a degree of thermal treatment to the particles.

12. Regarding claims 11-15, 20, 21, 24-26 and 39-42, Lewandowski et al. does not specifically disclose the method of material deposition, or an apparatus for material deposition. However, material deposition on a substrate is clearly suggested by Lewandowski et al. That is the step of depositing a material onto a substrate is suggested, and the apparatus comprising a substrate is also suggested. Any substrate inherently comprises a plurality of locations onto which the particles can be deposited. The step of moving the substrate is not specifically disclosed. However, the step of moving the substrate would have been obvious to deposit the particles at various locations on the substrate to form a pattern or to form a uniform coating across the substrate surface. The step would require the laser beam, and the confined particles, to exit the optical conductor through a second opening, optical fibers commonly comprising first and second openings. Therefore, claims 11-15, 20, 21, 24-26 and 39-42 are obvious over Lewandowski et al.

13. Regarding claims 22 and 23, as noted above, Lewandowski et al. discloses an aqueous solution, but does not specifically disclose the step of providing one or more liquid droplets or providing a solution and transforming the solvent into one or more liquid droplets. Material deposition methods comprising the step of providing a solution and transforming the solvent into one or more liquid droplets are well known in the art. The method steps of claims 22 and 23 would have been obvious to one having ordinary skill in the art as a means for providing particles for deposition. The modification to Lewandowski et al. to comprise the steps as claimed in claims 22 and 23 would have been obvious since the steps were well-known in the art and it appears that the invention of Lewandowski et al. would have performed equally well with any means for providing the particles for deposition.

14. Regarding claims 3, 35 and 36, Lewandowski et al. does not specifically disclose a focusing system. Focusing arrangements are well known in the art of fiber optics. A focusing arrangement would have been obvious for the purpose of increasing the coupling efficiency of the laser beam in to the hollow optical fiber. Additionally, Lewandowski et al. does not specifically disclose the step wherein the laser beam exits the optical fiber through a second opening. As stated previously, optical fibers commonly comprise first and second openings for coupling in and coupling out optical beams. The method step would have been obvious to couple out the laser beam and the confined particle for particle transfer, separation, or deposition, as suggested by Lewandowski et al.

15. **Claims 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ashkin (U.S. Patent 3,808,550) in view of Lewandowski et al.** Ashkin discloses a method of confining a particle, comprising directing a first laser beam in a first direction, directing a second laser

beam in a second direction which is collinear with the first direction, and confining the particle (by causing the first and the second laser beams to propagate toward each other) (see column 5, lines 56-68). Ashkin further discloses that changing an intensity of one or both laser beams changes a position of the confined particle (see column 6, lines 1-12). Ashkin does not specifically disclose an optical conductor having first and second opening disposed opposite to each other and through which the laser beams are directed. Lewandowski et al. discloses a method of guiding a particle inside a through channel of an optical fiber. Optical fibers commonly comprise first and second openings for coupling in and coupling out optical beams. Both disclosures relate to particle guidance and manipulation using a gradient force from a laser beam. One of ordinary skill in the art would have found it obvious to perform the method of Ashkin using a hollow optical conductor as disclosed by Lewandowski et al. One of ordinary skill in the art would have been motivated to modify the disclosure of Ashkin to comprise an optical conductor of Lewandowski et al. for the purpose of guiding the laser beam and the confined particles with greater precision. Regarding claim 28, Ashkin discloses that the laser beams are directed horizontally (see column 3, line 64).

16. **Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kindler et al. in view of Richart (U.S. Patent 5,854,311).** Kindler et al., discussed above, does not disclose the size of the powder particles. Richart discloses that an ideal coating powder is comprised of particles having sizes ranging from 10 to 40 μm, resulting in a coating of improved smoothness (see column 3, lines 33-37). Both Kindler et al. and Richart relate to coating powders. One of ordinary skill in the art would have found it obvious to comprise the coating powder of Kindler et al. with particles that are larger than about 10 nm in size, as taught by

Richart. One of ordinary skill in the art would have been motivated to provide the claimed particles to manufacture a coating with a high degree of smoothness, as taught by Richart.

Allowable Subject Matter

17. Claims 16-19 are allowed.

18. The following is a statement of reasons for the indication of allowable subject matter: The prior art of record does not disclose or suggest, alone or in combination; all of the method limitations as claimed. That is the prior art of record does not disclose or suggest, the steps of transforming at least a portion of the solution into a plurality of non-atomic droplets, confining the droplets inside a laser beam while directing the laser beam toward a first opening of an optical conductor having a through channel; transporting the droplets inside the through channel from the first opening to a second opening; and depositing the droplets of material onto the substrate after the laser beam exits the second opening of the optical conductor. Lewandowski et al. discloses transporting particles that are in an aqueous solution through an optical conductor by means of a laser beam, but does not disclose or suggest transporting droplets in an optical conductor. Therefore, claims 16-19 would be allowable over the prior art of record.

Response to Arguments

19. Applicant's arguments with respect to claims 1-42 have been considered but are moot in view of the new ground(s) of rejection.

20. Applicant's argument pertaining to the Lewandowski et al. reference is not persuasive. Applicant states that Lewandowski et al. is a non-enabling disclosure. Examiner respectfully disagrees. Although the disclosure is concise, Lewandowski et al. does in fact state that particles have been guided in a through channel of a hollow optical fiber by a laser beam. Lewandowski

et al. additionally discloses the particle size, the laser power, and the gradient force on the particles. Therefore, Examiner does not agree that one of ordinary skill in the art would not have been able to arrive at the claimed invention without undue experimentation. Thus, Lewandowski et al. anticipates the invention *as claimed*, as indicated in the 35 USC 102 rejections above. Any modifications to the disclosure of Lewandowski et al. to arrive at the invention as claimed would have been obvious for the reasons stated in the 35 USC 103 rejections above.

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Periasamy (U.S. Patent 5,336,556) also discloses a method and apparatus for guiding particles by means of a laser beam by directing a laser beam into a hollow portion of an optical conductor 1.

22. Any inquiry concerning the merits of this communication should be directed to Examiner Sarah Song at telephone number 703-306-5799. Any inquiry of a general or clerical nature, or relating to the status of this application or proceeding should be directed to the receptionist at telephone number 703-308-0956 or to the technical support staff supervisor at telephone number 703-308-3072.

Sarah N Song
sus
April 29, 2003

Brian Healy
Primary Examiner